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(19) **United States**(12) **Patent Application Publication****Bobde et al.**(10) **Pub. No.: US 2014/0239382 A1**(43) **Pub. Date: Aug. 28, 2014**(54) **HIGH FREQUENCY SWITCHING MOSFETS WITH LOW OUTPUT CAPACITANCE USING A DEPLETABLE P-SHIELD**(71) Applicant: **Alpha and Omega Semiconductor Incorporated**, Sunnyvale, CA (US)(72) Inventors: **Madhur Bobde**, Sunnyvale, CA (US); **Hamza Yilmaz**, Saratoga, CA (US); **Sik Lui**, Sunnyvale, CA (US); **Daniel Ng**, Campbell, CA (US)(73) Assignee: **Alpha and Omega Semiconductor Incorporated**, Sunnyvale, CA (US)(21) Appl. No.: **14/270,228**(22) Filed: **May 5, 2014****Related U.S. Application Data**

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USPC **257/328**(57) **ABSTRACT**

Aspects of the present disclosure describe a high density trench-based power MOSFETs with self-aligned source contacts and methods for making such devices. The source contacts are self-aligned with spacers and the active devices may have a two-step gate oxide. A lower portion may have a thickness that is larger than the thickness of an upper portion of the gate oxide. The MOSFETs also may include a depletable shield in a lower portion of the substrate. The depletable shield may be configured such that during a high drain bias the shield substantially depletes. It is emphasized that this abstract is provided to comply with rules requiring an abstract that will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims.

